In vitro protein protection and methane reduction in rumen using tannin extract from *Bauhinia hookeri*

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Abstract.

Reducing methane emissions is an important strategy for mitigating climate change. Tannins can inhibit the activity of methane-producing microorganisms, reduce extensive protein degradation, ammonia emission and increase available bypass protein in ruminants. This research was conducted to determine the effect of the tannin extract (TE) from *Bauhinia hookeri* hay on *in vitro* fermentation characteristics and protein protection of soybean and canola meals. Tannin extracts were mixed with canola meal or soybean meal at 0%, 2%, 4% and 6% DM, and incubated for 24 h using an ANKOM *in vitro* gas production system. The total gas production of treated canola meal was reduced by 16.4% at 2%, 30.1% at 4% and 52.7% at 6% of TE inclusion, $P < 0.05$. The 2% TE had no effect on methane production, while 4 and 6% reduced methane production by 37.2 and 40.4 %, respectively, $P < 0.05$. The total volatile fatty acid (VFA) concentrations of soybean meal were not affected by the inclusion of TE at 2 or 4%, but the inclusion of 6% decreased VFA concentration, $P < 0.05$. The untreated soybean and canola meal produced greater soluble proteins (fraction 'a') than their treated counterparts, $P < 0.001$. The degradable protein (fraction 'b') of treated soybean meal increased by 7.70, 12.8 and 12.7% in 2, 4 and 6% TE inclusion, respectively, $P < 0.001$. Likewise, the fraction 'b' was greater in treated canola meals compared to untreated canola meal and the use of TE decreased the degradation rate of fraction 'b', $P < 0.001$. Treating the meals with TE considerably decreased gas production, ammonia-N, methane emission, the solubility of the protein, and increased the lag time and protein fraction 'b'. This experiment demonstrated the potential of TE from *Bauhinia hookeri* for methane reduction and protein protection of protein-rich meals from rumen fermentation. Moreover, the application of 4% TE showed consistent results across parameters and could be preferred compared to 2 and 6% TE. Therefore, the strategic incorporation of tannins in the dairy industry could be a promising pathway not only for enhancing availability of utilisable protein for the cows but also for making substantial strides in the reduction of greenhouse gas emissions.

Additional keywords: gas production, methane, ammonia-N, protein fractions, condensed tannin